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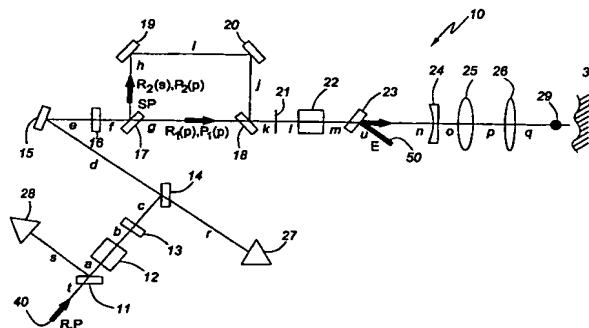
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[Continued on next page]

(54) Title: A DEVICE AND METHOD FOR NON-CONTACT SENSING OF LOW-CONCENTRATION AND TRACE SUB-
STANCES



(57) Abstract: A device for non contact detection of low concentration substances outside a laboratory environment is disclosed. A probing laser emission is split into two linear orthogonally polarized emission components and one component is delayed in time relative to the other. Both components are directed to a focal region that is proximate to a target medium thought to contain the substance to be detected. Between the arrival of the first and second emission components, an excitation light pulse at a wavelength corresponding to an absorption line in the spectrum of the substance is directed to the focal region. If vapours of the substance are present, they will be heated by the excitation pulse and will change the index of refraction of the focal region before the second emission component passes through it, thus altering the phase of the back-scattered emission returns. The device delays the first returned component by an equal delay and coherently couples the returned emission components. The amplitudes of the orthogonally polarized returned emission components are compared. If the probing laser is pulsed, the ratio of the polarized pulse components is observed to indicate the presence of the substance. Optionally, reference pulses for which no excitation pulse is generated may be introduced to provide a reference signal to rule out effects due to the intrinsic polarization caused by passage of the emission through optical components. If the probing laser is a continuous wave laser, the presence of transients timely correlated with excitation pulses in the detected continuous wave signal will indicate the presence of the substance.



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